

CLAIMS

1. An exposure method for transferring a pattern on a mask onto a substrate by using a catadioptric projection optical system that has a plurality of partial lens barrels that hold optical systems having optical axes that extend in mutually different directions, comprising:

measuring an amount of rotation of said catadioptric projection optical system about an optical axis which intersects at least one of said mask and said substrate; and

adjusting at least one of an attitude and a scan direction of at least one of said mask and said substrate based on a result of the measurement of the amount of rotation.

2. An exposure method in accordance with Claim 1, wherein:

said plurality of partial lens barrels include a first partial lens barrel, which has a first optical axis that extends from said mask to said substrate, and a second partial lens barrel, which has a second optical axis that intersects said first optical axis; and

the amount of rotation of said catadioptric projection optical system is obtained from a detection result of reflected light obtained by emitting detection light to reflecting mirrors attached to at least two parts of said first partial lens barrel.

3. An exposure method in accordance with Claim 1, wherein:

said plurality of partial lens barrels include a first partial lens barrel, which has a first optical axis that extends from said mask to said substrate, and a second partial lens barrel, which has a second optical axis that intersects said first optical axis; and

the amount of rotation of said catadioptric projection optical system is obtained from a result of detection of position measurement marks attached to at least two parts of said first partial lens barrel.

4. An exposure method in accordance with Claim 1, wherein the amount of rotation of said catadioptric projection optical system is obtained from a detection result of an acceleration sensor attached to said catadioptric projection optical system.

5. An exposure method for transferring a pattern on a mask onto a substrate by using a catadioptric projection optical system that has a partial lens barrel that holds an optical system having optical axes that extend in mutually different directions while scanning the mask and the substrate, comprising:

adjusting at least one of an attitude and a scan direction of at least one of said mask and said substrate in accordance with an amount of rotation of said catadioptric projection optical system about an optical axis intersecting at least one of said mask and said substrate.

6. An exposure apparatus which has a catadioptric projection optical system having a plurality of partial lens barrels having optical axes that extend in mutually different directions, a mask stage that holds a mask, and a substrate stage that holds a substrate, and which transfers a pattern on said mask onto said substrate via said catadioptric projection optical system, comprising:

a measuring device which measures an amount of rotation of said catadioptric projection optical system about an optical axis that intersects at least one of said mask and said substrate; and

a control device which adjusts at least one of an attitude and a scan direction of at least one of said mask stage and said substrate stage based on a result of the measurement of the amount of rotation.

7. An exposure apparatus in accordance with Claim 6, wherein said plurality of partial lens barrels include a first partial lens barrel, which has a first optical axis that extends from said mask to said substrate, and a second partial lens barrel, which has a second optical axis that intersects said first optical axis.
8. An exposure apparatus in accordance with Claim 7, wherein said measuring device measures the amount of rotation of said catadioptric projection optical system by making at least one of said plurality of partial lens barrels a subject for the measurement.
9. An exposure apparatus in accordance with Claim 8, wherein said measuring device emits detection light to reflecting mirrors attached to at least two parts of said first partial lens barrel and obtains the amount of rotation of said catadioptric projection optical system from position information of each of said reflecting mirrors.
10. An exposure apparatus in accordance with Claim 8, wherein said measuring device observes position measurement marks attached to at least two parts of said first partial lens barrel and obtains the amount of rotation of said catadioptric projection optical system from a result of the observation.

11. An exposure apparatus in accordance with Claim 8, wherein said measuring device obtains the amount of rotation of said catadioptric projection optical system from a detection result of an acceleration sensor attached to said catadioptric projection optical system.

12. An exposure apparatus in accordance with Claim 7, wherein said second partial lens barrel includes a reflecting mirror and a lens.

13. A device manufacturing method, comprising:

an exposure step of performing an exposure process on a substrate using an exposure method in accordance with any one of Claim 1 to Claim 5 or an exposure apparatus in accordance with any one of Claim 6 to Claim 12; and

a development step of performing development of the substrate that has gone through said exposure step.